[0180] It is understood that the examples and embodiments described herein are for illustrative purposes only and that various modifications or changes in light thereof will be suggested to persons skilled in the art and are to be included within the spirit and purview of this application and scope of the appended claims. All publications, patents, and patent applications cited herein are hereby incorporated by reference in their entirety for all purposes.

WHAT IS CLAIMED IS:

1. An isolated immunogenic peptide of 50 or fewer amino acids comprising an amino acid sequence $X_1X_2X_3PSAPSPX_4$ (SEQ ID NO:5), wherein:

X_1 can be any amino acid;

X_2 can be L, M, A, I, V, or T;

X_3 can be a hydrophobic residue, methionine or alanine; and

X_4 can be V, M, L, A, I, or T.

2. An immunogenic peptide of claim 1 wherein X_1 is tyrosine (SEQ ID NO:34).

3. An immunogenic peptide of claim 1 wherein X_2 is leucine (SEQ ID NO:35).

4. An immunogenic peptide of claim 1 wherein X_3 is methionine (SEQ ID NO:36).

5. An immunogenic peptide of claim 1 wherein X_4 is valine (SEQ ID NO:37).

6. An immunogenic peptide of claim 1 comprising an amino acid sequence selected from the group consisting of GVFPSAPSPV (SEQ ID NO:6), YVFPSAPSPV (SEQ ID NO:7), GLFPSAPSPV (SEQ ID NO:8), GVMPSAPSPV (SEQ ID NO:9), YLFPSAPSPV (SEQ ID NO:10), and GLMPSAPSPV (SEQ ID NO:11).

7. An immunogenic peptide of claim 1, which peptide is a ten amino acid peptide having an amino acid sequence selected from the group consisting of GVFPSAPSPV (SEQ ID NO:6), YVFPSAPSPV (SEQ ID NO:7), GLFPSAPSPV (SEQ ID NO:8), GVMPSAPSPV (SEQ ID NO:9), YLFPSAPSPV (SEQ ID NO:10), and GLMPSAPSPV (SEQ ID NO:11).

8. A composition comprising:

i) an isolated immunogenic peptide of fifty or fewer amino acids comprising the sequence of $X_1X_2X_3PSAPSPX_4$ (SEQ ID NO:5), wherein:

X_1 can be any amino acid;

X_2 can be L, M, A, I, V, or T;

X_3 can be a hydrophobic residue, methionine, or alanine ; and

X_4 can be V, M, L, A, I, or T; and,

ii) a pharmaceutically acceptable carrier.

9. A composition of claim 8 wherein X_1 is tyrosine (SEQ ID NO:34).

10. A composition of claim 8 wherein X_2 is leucine (SEQ ID NO:35).

11. A composition of claim 8 wherein X_3 is methionine (SEQ ID NO:36).

12. A composition of claim 8 wherein X_4 is valine (SEQ ID NO:37).

13. A composition of claim 8 comprising an amino acid sequence selected from the group consisting of GVFPSAPSPV (SEQ ID NO:6), YVFPSAPSPV (SEQ ID NO:7), GLFPSAPSPV (SEQ ID NO:8), GVMPSAPSPV (SEQ ID NO:9), YLFPSAPSPV (SEQ ID NO:10), and GLMPSAPSPV (SEQ ID NO:11).

14. A composition of claim 8 which peptide is a ten amino acid peptide having an amino acid sequence selected from the group consisting of GVFPSAPSPV (SEQ ID NO:6), YVFPSAPSPV (SEQ ID NO:7), GLFPSAPSPV (SEQ ID NO:8), GVMPSAPSPV (SEQ ID NO:9), YLFPSAPSPV (SEQ ID NO:10), and GLMPSAPSPV (SEQ ID NO:11).

15. A use of an isolated immunogenic peptide of fifty or fewer amino acids comprising a sequence of $X_1X_2X_3$PSAPSPX_4 (SEQ ID NO:5), wherein:

X_1 can be any amino acid;

X_2 can be L, M, A, I, V, or T;

X_3 can be a hydrophobic residue, methionine or alanine; and

X_4 can be V, M, L, A, I, or T;

for the manufacture of a medicament to raise an immune response to cells expressing a protein encoded by XAGE-1.

16. A use of claim 15 wherein X_1 is tyrosine (SEQ ID NO:34).

17. A use of claim 15 wherein X_2 is a leucine (SEQ ID NO:35).

18. A use of claim 15 wherein X_3 is a methionine (SEQ ID NO:36).

19. A use of claim 15, wherein said peptide comprises an amino acid sequence selected from the group consisting of GVFPSAPSPV (SEQ ID NO:6), YVFPSAPSPV (SEQ ID NO:7), GLFPSAPSPV (SEQ ID NO:8), GVMPSAPSPV (SEQ ID NO:9), YLFPSAPSPV (SEQ ID NO:10), and GLMPSAPSPV (SEQ ID NO:11).

20. A use of claim 15, which peptide is a ten amino acid peptide having a sequence selected from the group consisting of GVFPSAPSPV (SEQ ID NO:6), YVFPSAPSPV (SEQ ID NO:7), GLFPSAPSPV (SEQ ID NO:8), GVMPSAPSPV (SEQ ID NO:9), YLFPSAPSPV (SEQ ID NO:10), and GLMPSAPSPV (SEQ ID NO:11).

21. A method of inhibiting growth of an XAGE-1-expressing cancer cell, said method administering a peptide of fifty or fewer amino acids, said peptide comprising a sequence of $X_1X_2X_3$PSAPSPX_4 (SEQ ID NO:5), wherein:

X_1 can be any amino acid;

X_2 can be L, M, A, I, V, or T;

X_3 can be a hydrophobic residue, methionine, or alanine; and

X_4 can be V, M, L, A, I, or T

wherein administration of said peptide stimulates or activates cytotoxic T lymphocytes, thereby inhibiting growth of said XAGE-1-expressing cancer cell.

22. A method of claim 21 wherein X_1 is a tyrosine (SEQ ID NO:34).

23. A method of claim 21 wherein X_2 is a leucine (SEQ ID NO:35).

24. A method of claim 21 wherein X_3 is a methionine (SEQ ID NO:36).

25. A method of claim 21, wherein said peptide comprises an amino acid sequence selected from the group consisting of GVFPSAPSPV (SEQ ID NO:6), YVFPSAPSPV (SEQ ID NO:7), GLFPSAPSPV (SEQ ID NO:8), GVMPSAPSPV (SEQ ID NO:9), YLFPSAPSPV (SEQ ID NO:10), and GLMPSAPSPV (SEQ ID NO:11).

26. A method of claim 21, wherein said peptide has an amino acid sequence selected from the group consisting of GVFPSAPSPV (SEQ ID NO:6), YVFPSAPSPV (SEQ ID NO:7), GLFPSAPSPV (SEQ ID NO:8), GVMPSAPSPV (SEQ ID NO:9), YLFPSAPSPV (SEQ ID NO:10), and GLMPSAPSPV (SEQ ID NO:11).

27. A method of claim 21, further comprising administering an immunostimulant or an antagonist of immunosuppressive cytokines.

28. An isolated nucleic acid encoding a peptide of fifty or fewer amino acids, said peptide comprising a sequence $X_1X_2X_3PSAPSPX_4$ (SEQ ID NO:5), wherein:

X_1 can be any amino acid;

X_2 can be L, M, A, I, V, or T;

X_3 can be a hydrophobic residue, methionine, or alanine; and

X_4 can be V, M, L, A, I, or T.

29. An isolated nucleic acid of claim 28, wherein X_1 is tyrosine (SEQ ID NO:34).

30. An isolated nucleic acid of claim 28 wherein X_2 is leucine (SEQ ID NO:35).

31. An isolated nucleic acid of claim 28 wherein X_3 is methionine (SEQ ID NO:36).

32. An isolated nucleic acid of claim 28, wherein said peptide comprises an amino acid sequence selected from the group consisting of GVFPSAPSPV (SEQ ID NO:6), YVFPSAPSPV (SEQ ID NO:7), GLFPSAPSPV (SEQ ID NO:8), GVMPSAPSPV (SEQ ID NO:9), YLFPSAPSPV (SEQ ID NO:10), and GLMPSAPSPV (SEQ ID NO:11).

33. An isolated nucleic acid of claim 28, wherein said peptide has an amino acid sequence selected from the group consisting of GVFPSAPSPV (SEQ ID NO:6), YVFPSAPSPV (SEQ ID NO:7), GLFPSAPSPV (SEQ ID NO:8), GVMPSAPSPV (SEQ ID NO:9), YLFPSAPSPV (SEQ ID NO:10), and GLMPSAPSPV (SEQ ID NO:11).

34. A vector comprising a nucleic acid sequence of claim 28 operably linked to a promoter.

35. A vector of claim 34, wherein said nucleic acid sequence encodes a peptide comprising an amino acid sequence selected from the group consisting of GVFPSAPSPV (SEQ ID NO:6), YVFPSAPSPV (SEQ ID NO:7), GLFPSAPSPV (SEQ ID

NO:8), GVMPSAPSPV (SEQ ID NO:9), YLFPSAPSPV (SEQ ID NO:10), and GLMPSAPSPV (SEQ ID NO:11).

36. A composition comprising a vector of claim 34 and a pharmaceutically acceptable carrier.

37. A composition of claim 36, wherein said vector encodes a peptide comprising an amino acid sequence selected from the group consisting of GVFPSAPSPV (SEQ ID NO:6), YVFPSAPSPV (SEQ ID NO:7), GLFPSAPSPV (SEQ ID NO:8), GVMPSAPSPV (SEQ ID NO:9), YLFPSAPSPV (SEQ ID NO:10), and GLMPSAPSPV (SEQ ID NO:11).

38. A use of a nucleic acid of claim 28 for the manufacture of a medicament to inhibit the growth of a XAGE-1-expressing cancer cell in a subject.

39. A use of claim 38, wherein said nucleic acid encodes a peptide comprising an amino acid sequence selected from the group consisting of GVFPSAPSPV (SEQ ID NO:6), YVFPSAPSPV (SEQ ID NO:7), GLFPSAPSPV (SEQ ID NO:8), GVMPSAPSPV (SEQ ID NO:9), YLFPSAPSPV (SEQ ID NO:10), and GLMPSAPSPV (SEQ ID NO:11).

40. A method of inhibiting the growth of an XAGE-1-expressing cancer cell, said method comprising administering an isolated nucleic acid sequence encoding a peptide of fifty or fewer amino acids, said peptide comprising of the sequence $X_1X_2X_3$PSAPSPX_4 (SEQ ID NO:5), wherein: X_1 can be any amino acid; X_2 can be L, M, A, I, V, or T; X_3 can be a hydrophobic residue, methionine, or alanine; and X_4 can be V, M, L, A, I, or T; wherein administration of said nucleic acid sequence results in expression of said peptide, which stimulates or activates cytotoxic T lymphocytes, thereby inhibiting the growth of said XAGE-1-expressing cancer cell.

41. A method of claim 40 wherein X_1 is tyrosine (SEQ ID NO:34).

42. A method of claim 40 wherein X_2 is leucine (SEQ ID NO:35).

43. A method of claim 40 wherein X_3 is methionine (SEQ ID NO:36).

44. A method of claim 40, wherein said peptide comprises an amino acid sequence selected from the group consisting of GVFPSAPSPV (SEQ ID NO:6), YVFPSAPSPV (SEQ ID NO:7), GLFPSAPSPV (SEQ ID NO:8), GVMPSAPSPV (SEQ ID NO:9), YLFPSAPSPV (SEQ ID NO:10), and GLMPSAPSPV (SEQ ID NO:11).

45. A method of claim 40, wherein said peptide has an amino acid sequence selected from the group consisting of GVFPSAPSPV (SEQ ID NO:6), YVFPSAPSPV (SEQ ID NO:7), GLFPSAPSPV (SEQ ID NO:8), GVMPSAPSPV (SEQ ID NO:9), YLFPSAPSPV (SEQ ID NO:10), and GLMPSAPSPV (SEQ ID NO:11).

46. A method for stimulating or expanding T cells, or both, comprising contacting T cells with a synthetic or recombinant amino acid sequence $X_1X_2X_3$PSAPSPX_4 (SEQ ID NO:5), wherein: X_1 can be any amino acid; X_2 can be L, M, A, I, V, or T; X_3 can be a hydrophobic residue, methionine, or alanine; and X_4 can be V, M, L, A, I, or T; thereby stimulating or expanding said T cells, or both.

47. A method of claim 46, wherein X_1 is tyrosine (SEQ ID NO:34).

48. A method of claim 46, wherein X_2 is leucine (SEQ ID NO:35).

49. A method of claim 46, wherein X_3 is methionine (SEQ ID NO:36).

50. A method of claim 46, wherein said peptide comprises an amino acid sequence selected from the group consisting of GVFPSAPSPV (SEQ ID NO:6), YVFPSAPSPV (SEQ ID NO:7), GLFPSAPSPV (SEQ ID NO:8), GVMPSAPSPV (SEQ ID NO:9), YLFPSAPSPV (SEQ ID NO:10), and GLMPSAPSPV (SEQ ID NO:11).

51. A method of claim 46, wherein said peptide has an amino acid sequence selected from the group consisting of GVFPSAPSPV (SEQ ID NO:6), YVFPSAPSPV (SEQ ID NO:7), GLFPSAPSPV (SEQ ID NO:8), GVMPSAPSPV (SEQ ID NO:9), YLFPSAPSPV (SEQ ID NO:10), and GLMPSAPSPV (SEQ ID NO:11).

52. A method of claim 46, wherein said T cells are isolated from bone marrow, or a fraction thereof, of a patient.

53. A method of claim 46, wherein said T cells are isolated from peripheral blood, or a fraction thereof, of a patient.

54. A method of claim 46, wherein said T cells are contacted with said peptide by contacting said T cells with an antigen presenting cell pulsed with, transduced to express, or differentiated from a cell transduced with a nucleic acid encoding, said peptide.

55. A method of claim 46, wherein said T cells are contacted with an antigen presenting cell pulsed with, transduced to express, or differentiated from a cell transduced with a nucleic acid encoding, a peptide having an amino acid sequence selected from the group consisting of GVFPSAPSPV (SEQ ID NO:6), YVFPSAPSPV (SEQ ID NO:7), GLFPSAPSPV (SEQ ID NO:8), GVMPSAPSPV (SEQ ID NO:9), YLFPSAPSPV (SEQ ID NO:10), and GLMPSAPSPV (SEQ ID NO:11).

56. A method of claim 46, wherein said T cells are CD8+ T cells.

57. A method for stimulating or expanding T cells comprising contacting said T cells with an antigen presenting cell pulsed with, transduced to express, or differentiated from a cell transduced with a nucleic acid encoding, an amino acid sequence of $X_1X_2X_3PSAPSPX_4$ (SEQ ID NO:5), wherein: X_1 can be any amino acid; X_2 can be L, M, A, I, V, or T; X_3 can be a hydrophobic residue, methionine, or alanine; and X_4 can be V, M, L, A, I, or T.

58. A method of claim 57, wherein X_1 is tyrosine (SEQ ID NO:34).

59. A method of claim 57, wherein X_2 is leucine (SEQ ID NO:35).

60. A method of claim 57, wherein X_3 is alanine (SEQ ID NO:36).

61. A method of claim 57, wherein said peptide comprises an amino acid sequence selected from the group consisting of GVFPSAPSPV (SEQ ID NO:6), YVFPSAPSPV (SEQ ID NO:7), GLFPSAPSPV (SEQ ID NO:8), GVMPSAPSPV (SEQ ID NO:9), YLFPSAPSPV (SEQ ID NO:10), and GLMPSAPSPV (SEQ ID NO:11).

62. A method of claim 57, wherein said peptide has an amino acid sequence selected from the group consisting of GVFPSAPSPV (SEQ ID NO:6), YVFPSAPSPV (SEQ ID NO:7), GLFPSAPSPV (SEQ ID NO:8), GVMPSAPSPV (SEQ ID NO:9), YLFPSAPSPV (SEQ ID NO:10), and GLMPSAPSPV (SEQ ID NO:11).

63. A method of inhibiting the growth of a cancer cell expressing XAGE-1 comprising contacting said cell with a cytotoxic T lymphocyte specific for a peptide comprising an amino acid sequence of $X_1X_2X_3PSAPSPX_4$ (SEQ ID NO:5), wherein: X_1 can be any amino acid; X_2 can be L, M, A, I, V, or T; X_3 can be a hydrophobic residue, methionine, or alanine; and X_4 can be V, M, L, A, I, or T.

64. A method of claim 63, wherein said peptide comprises an amino acid sequence selected from the group consisting of GVFPSAPSPV (SEQ ID NO:6), YVFPSAPSPV (SEQ ID NO:7), GLFPSAPSPV (SEQ ID NO:8), GVMPSAPSPV (SEQ ID NO:9), YLFPSAPSPV (SEQ ID NO:10), and GLMPSAPSPV (SEQ ID NO:11).

65. A method of claim 63, wherein said peptide has an amino acid sequence selected from the group consisting of GVFPSAPSPV (SEQ ID NO:6), YVFPSAPSPV (SEQ ID NO:7), GLFPSAPSPV (SEQ ID NO:8), GVMPSAPSPV (SEQ ID NO:9), YLFPSAPSPV (SEQ ID NO:10), and GLMPSAPSPV (SEQ ID NO:11).

66. An isolated immunogenic peptide of 50 or fewer amino acids comprising an amino acid sequence $X_1X_2X_3PSA\ X_5\ X_6\ X_7X_4$ (SEQ ID NO:41), wherein: X_1 can be any amino acid; X_2 can be L, M, A, I, V, or T; X_3 can be a hydrophobic residue, methionine, or alanine; and X_4 can be V, M, L, A, I, or T; X_5 is either proline or is absent; X_6 is either serine or is absent; and X_7 is either proline or is absent; provided that, (i) when X_5 is absent, X_6 is serine and X_7 is proline; (ii) when X_6 is absent, X_5 and X_7 are proline, and (iii) when X_7 is absent, X_5 is proline and X_6 is serine.

67. A use of an isolated immunogenic peptide of claim 66 for the manufacture of a medicament to raise an immune response to cells expressing a protein encoded by XAGE-1.

68. An isolated nucleic acid encoding an immunogenic peptide of claim 66.

69. A use of an isolated nucleic acid of claim 68 for the manufacture of a medicament to raise an immune response to cells expressing a protein encoded by XAGE-1.

70. A method of inhibiting the growth of an XAGE-1-expressing cancer cell, said method comprising administering an isolated immunogenic peptide of claim 66,

wherein administration of said peptide stimulates or activates cytotoxic T lymphocytes against a protein expressed from XAGE-1, thereby inhibiting the growth of said XAGE-1-expressing cancer cell.

71. A method of inhibiting the growth of an XAGE-1-expressing cancer cell, said method comprising administering an isolated nucleic acid sequence of claim 68; wherein administration of said nucleic acid sequence results in expression of a peptide which stimulates or activates cytotoxic T lymphocytes against a protein expressed from XAGE-1, thereby inhibiting the growth of said XAGE-1-expressing cancer cell.

72. A method for stimulating or expanding T cells in vitro comprising contacting said T cells with an isolated peptide of claim 66.

73. A method of inhibiting the growth of an XAGE-1-expressing cancer cell, comprising contacting said cell with a cytotoxic T lymphocyte specific for a peptide comprising a sequence of SEQ ID NO:5.

74. A method of inhibiting the growth of an XAGE-1-expressing cancer cell, comprising contacting said cell with a cytotoxic T lymphocyte specific for a peptide comprising a sequence of SEQ ID NO:41.